



What's special about Chemical, Biological, Radiological, and Nuclear (CBRN) air-purifying respirators (APR)?

NIOSH Fact Sheet

The guidance recommended in this fact sheet will help respiratory protection program administrators, managers, and air-purifying respirator (APR) wearers understand the special features of a NIOSH-approved Chemical, Biological, Radiological, and Nuclear (CBRN) APR. These types of respirators have unique performance, use limitations, and storage requirements compared to NIOSH-approved industrial APR. The respiratory protection program administrator should assure that CBRN APR manufacturer recommendations are addressed. This information may also be used by managers and APR wearers to optimize personal protection.

When using, purchasing, or storing a CBRN APR, the requirements set by NIOSH, Occupational Safety and Health Administration (OSHA), and the manufacturer of the specific unit should all be taken into consideration. Remember, approved CBRN APR may only be used for escape from an atmosphere that has become immediately dangerous to life or health. These respirators must not be used in oxygen-deficient atmospheres or to enter an atmosphere immediately dangerous to life or health. OSHA defines an atmosphere immediately dangerous to life or health as follows: An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would interfere with an individual's ability to escape from a dangerous atmosphere (29 CFR 1910.120(a)(3)).

What is the significance of the CBRN standards?

In January 2004, the National Institute for Occupational Safety and Health (NIOSH) implemented a voluntary approval program for CBRN APR. NIOSH standards and tests provide scientifically-based, industry-accepted evaluation criteria that establish levels of protection for approved respirators. These respirators are tested to ensure they meet these levels of protection against specified levels of CBRN agents. The standards and tests significantly affect selection, use, and maintenance requirements of CBRN APR as compared to other NIOSH-approved industrial APR.

A complete description of the standards and tests are available at:
<http://www.cdc.gov/niosh/npptl/respstds.html#approved> and
http://www.cdc.gov/niosh/npptl/stps/respirator_testing.htm#STP APR CBRN.

To ensure the proper care, effective use, and derive optimal protective benefits of a CBRN APR, a respiratory protection program administrator must be aware of the CBRN APR's unique performance capabilities, limitations of use and special storage requirements specified by the manufacturer. APR wearers should also be trained to fully understand and appreciate the unique characteristics of the CBRN APR in order to obtain optimal protection during use.

A NIOSH-approved APR that is not approved with CBRN protection must not be for protection against chemical warfare agents. *Always refer to and understand the manufacturer's user instructions.*

How can one determine if the APR is NIOSH-approved for CBRN protection level?

Each NIOSH certificate of approval includes labels to be used by the applicant. To determine if an APR has been approved by NIOSH for CBRN protection, the full NIOSH approval label for the facepiece and canister should be consulted. A full approval label contains important information to assist users in understanding the respirator, its protections, cautions and limitations of use, and approved assembly of components. This is a paper label provided with the facepiece and canister.

The full approval label contains the following:

- Department of Health and Human Services (DHHS) and NIOSH Logos.
- NIOSH TC approval number—The NIOSH approval number (TC-14G-XXXX for tight-fit CBRN gas mask) shown with row of components. “CBRN” is not contained in the approval number.
- Type and level of protection—The CBRN protection is listed with “CBRN” and a capacity level (e.g., CBRN Cap1, CBRN Cap2).
- Exact part numbers of the CBRN components listed in a row

beginning with the NIOSH TC approval number.

- Caution and limitation statements.

Care must be taken to identify the components of the APR with CBRN protection because the full NIOSH approval label may contain both CBRN APR and non-CBRN protection. The respiratory protection program administrator should assure the APR is assembled with the correct components for the required protection.

Labels attached directly on the CBRN canister are most often adhesive labels and the printed labels appearing on their containers provide condensed information. The canister label includes the NIOSH emblem, the applicant's name and address, an approval number assigned by the Institute, protections (e.g. CBRN Cap1, CBRN Cap2), and cautions or limitations of use placed on the CBRN APR by the Institute. It does not contain the listing of the components required for the NIOSH approved assembly.

The labels placed on canisters are also color coded. The color of a CBRN APR canister is olive. The color marking can be achieved by either the color of the label or the body of the component. Where the color marking is achieved by label color, the body of the component may be any color.

Other components such as the facepiece of the CBRN APR assembly are not required to contain the NIOSH emblem or CBRN marking. Components are not required by NIOSH to be individually labeled/marketed “CBRN”. Some manufacturers may label the actual components with CBRN logo but most do

not. NIOSH requires that each respirator component and container be labeled distinctly to show the lot number, serial number, or approximate date of manufacture of the component.

For more details on how to read a NIOSH approval label, refer to the NIOSH Fast Fact sheet on *NIOSH Approval Labels—Key Information to Protect Yourself*, posted on the NIOSH National Personal Protective Technology Laboratory (NPPTL) website at:
<http://www.cdc.gov/niosh/docs/2011-179/>

How do CBRN APR testing procedures apply to real-world use?

Chemical Agent Permeation and Penetration Resistance Tests

These tests assure that under specified laboratory conditions the CBRN APR assembly of components, including the materials used in the respirator construction (facepiece, valves, lens, gaskets, etc.), resist chemical warfare agent migration through the completely assembled APR. Only those components with specific part numbers as listed in the NIOSH approval can be a component of the NIOSH-approved CBRN APR assembly and expected to provide this protection. Industrial APR with canisters is not tested against chemical warfare agent and evaluated for permeation and penetration. The components of industrial APR and CBRN APR are not interchangeable even if they appear to be similar.

Some NIOSH-approved CBRN APR require special components (e.g., lens outserts

[protective coverings], mask skins/covers), which must be in place for the respirator to provide CBRN protection.

Failure to use the eyepiece outserts and the top skin/cover as specified in the NIOSH approval may result in permeation of warfare agents through the facepiece. Use of components not listed on the full NIOSH approval label for the CBRN APR facepiece or canister constitutes components not included in the NIOSH CBRN APR approval and may result in serious injury and/or death of the wearer.

The CBRN APR assembly of components is required to have a minimum test life of at least 8 hours against 50 mg/m³ distilled sulfur mustard (HD) vapor or 210 mg/m³ sarin (GB) vapor. Additionally, these respirators have a limitation of two hours when exposed to liquid droplets or vapor.

A CBRN APR is considered to be contaminated and must be discarded after initial contact with any liquid or vapor phase chemical warfare agent, regardless of the duration or frequency of such contact. The entire CBRN APR must be decontaminated and disposed of in accordance with manufacturer's instructions and applicable regulations.

Canister Gas/Vapor Challenge and Breakthrough Concentration Service Life Tests

NIOSH evaluates CBRN canisters in laboratory tests for concentrations of gas or vapor breakthrough (passing through the canister) at various flow rates, concentrations, and durations. NIOSH tests the canister to the minimum

laboratory service life (test time) specified by the manufacturer.

For less than a 60 minute service life, the canister capacity is specified in 15-minute intervals, identified by a capacity level. A designation of Cap1 refers to a laboratory-rated service life of 15 minutes, Cap2—30 minutes, and Cap3—45 minutes. The canister must meet or exceed the manufacturer's specified service life time during the laboratory test without exceeding the NIOSH identified breakthrough concentration level for the test gas or vapor.

Workplace conditions are rarely identical to laboratory-controlled tests. Therefore, the actual in-use service life of a CBRN APR when used in the workplace may differ from the NIOSH laboratory-rated performance. A change schedule should be established by the person responsible for respirator use prior to using a CBRN APR.

Laboratory Respirator Protection Level (LRPL) Test

This test assesses the respirator's ability to fit a wide range of facial sizes and shapes. It also ensures that instructions for the facepiece size selection and donning are understood and effective.

The LRPL test does not preclude the need to conduct an individual fit test of the CBRN APR facepiece for each wearer as required by OSHA. It should be noted that the manufacturer specified quantitative fit factor required in conducting an individual fit test of a CBRN APR may differ from the OSHA required value of 500 (10x the assigned protection factor of 50) for a tight-fitting full facepiece respirator. Respirator manufacturers may

specify a quantitative fit factor higher than that required by OSHA. For example, where OSHA requires a fit factor of 500 for a tight-fitting full facepiece, the APR manufacturer may recommend a quantitative fit factor as high as 2,500. Care must be taken by the RPP administrator in assuring a proper fit for each wearer as specified in the manufacturer's user instructions.

Always refer to the manufacturer's use instructions included with each CBRN APR facepiece for the recommended minimum quantitative fit factor.

Are CBRN APR components interchangeable regardless of manufacturer?

Unlike industrial APR, CBRN APR are evaluated by NIOSH to assure that each CBRN canister can provide the specified level of protection on all facepieces that are a component of a NIOSH-approved CBRN APR assembly, regardless of manufacturer. NIOSH assures this interoperability of components through design requirements controlling the respirator/canister connector and the canister physical characteristics. NIOSH also assures that the use of facepieces and canisters from different manufacturers and NIOSH-approved CBRN assemblies will not affect the fit of the respirator.

When assembled in this configuration, know that the respirator is not in the approved configuration and may not provide the same performance features (e.g. breathing resistance). However, OSHA may permit the interoperable use of CBRN APR facepieces and canisters among NIOSH-approved CBRN APR

during emergencies only. Thus, mixing CBRN facepieces and CBRN canisters among NIOSH-approved respirators during non-emergency operations is not permitted outside an emergency situation.

What are the Minimum Packaging Requirements?

The CBRN APR and its required components are subjected by NIOSH to environmental and durability conditioning tests in the manufacturer-specified minimum packaging configuration (MPC). The MPC is the protective packaging in which the end user will store or maintain the CBRN APR and the required components. Failure to store the CBRN APR in the manufacturer's recommended MPC may allow damage to occur that could affect the APR or its components to provide the expected level of protection. The damage may not be detectable by the user prior to use.

Examples of common MPC's include hard plastic carriers, clamshell containers, drawstring plastic bags, and hermetically sealed canister bags. Each manufacturer is likely to have unique packaging. The manufacturer's user instructions and the full NIOSH approval label will identify the required MPC.

In addition to the MPC, the canister packaging and vacuum or airtight-sealed wrapping are commonly marked with a shelf life date. This date indicates the expiration date of the component. The canister can be used up to the expiration date if it has been maintained as specified by the manufacturer. The canister should not be used if the expiration date has

been exceeded. Additionally, always store the canister in the manner (packaging, environmental temperatures and humidity, etc.) described by the manufacturer. For CBRN canisters stored in an MPC inspect the MPC for damage as described by the manufacturer. Do not use the canister if the vacuum or airtight sealed wrapping is damaged.

Authors:

Richard W. Metzler, Program Analyst,
DHHS, Federal Occupational Health
Program, Environmental Health Services
Division

Jonathan V. Szalajda, Engineer, National
Institute for Occupational Safety and
Health, National Personal Protective
Technology Laboratory



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